

MONTANE OAK–HICKORY FOREST (ACIDIC SUBTYPE)

Concept: Montane Oak–Hickory Forests are common mountain forests dominated by mixtures of oaks with *Quercus alba* as a significant component. The Acidic Subtype covers the broad ranges of examples with typical acid-loving herbs and heath shrubs. This subtype lacks indicators of circumneutral soils and also lacks low elevation dry-site species.

Distinguishing Features: All Montane Oak–Hickory Forests are distinguished from other Mountain Oak Forest communities by having a canopy containing significant *Quercus alba* (10% of the canopy or more) mixed with other oaks, hickories, or pines. Chestnut Oak Forest, Low Montane Red Oak Forest, and High Elevation Red Oak Forest have very little or no *Quercus alba*. High Elevation White Oak Forest has a canopy strongly dominated by *Quercus alba* and a dense heath layer occurring at elevations above 4000 feet. Montane Oak–Hickory Forests are distinguished from Oak–Hickory Forests of the Piedmont by having a significant component of montane flora, such as *Castanea dentata*, *Rhododendron calendulaceum*, *Kalmia latifolia*, *Magnolia fraseri*, and *Gaylussacia ursina*.

The Acidic Subtype is distinguished from the closely related White Pine Subtype by the absence or scarcity of *Pinus strobus* in the canopy. It is distinguished from the Basic Subtype by the absence or scarcity of plants that prefer circumneutral or higher soil pH, species such as *Fraxinus americana*, *Tilia americana* var. *heterophylla*, *Collinsonia canadensis*, *Sanguinaria canadensis*, *Actaea racemosa*, and *Caulophyllum thalictroides*. It is distinguished from the Low Dry Subtype by the absence of more typically Piedmont xerophytic species such as *Pinus echinata*, *Quercus falcata*, *Quercus stellata*, and *Quercus marilandica*.

Synonyms: *Quercus alba* - *Quercus (rubra, prinus)* / *Rhododendron calendulaceum* - *Kalmia latifolia* - (*Gaylussacia ursina*) Forest (CEGL007230).

Ecological Systems: Southern Appalachian Oak Forest (CES202.886).

Sites: Montane Oak–Hickory Forest (Acidic Subtype) occurs on ridge tops and on upper to lower slopes, spur ridges, and some valley flats. It occurs over a tremendous range of elevation, from 1000-5800 feet, with examples common over most of that range.

Soils: This community occurs on a broad range of uplands soils, mostly Typic Hapludults such as Chester, Evard and Watauga, or Typic Dystrudepts such as Ashe, Chestnut, Porters, and Stecoah.

Hydrology: Sites are well drained, and conditions generally are dry-mesic to dry.

Vegetation: The forest is dominated by varying combinations of *Quercus alba*, *Quercus rubra*, *Quercus montana*, and *Quercus coccinea*. Any of these species may be most abundant, but *Quercus alba* is always present in more than token numbers. *Carya glabra*, *Carya tomentosa*, *Quercus velutina*, *Acer rubrum*, and *Liriodendron tulipifera* are also frequent in the canopy. *Castanea dentata* once dominated or codominated and remains highly constant in the understory or shrub layer. Highly constant understory species in CVS plot data include *Oxydendrum arboreum*, *Sassafras albidum*, *Nyssa sylvatica*, and *Cornus florida*. *Magnolia fraseri*, *Prunus serotina*, and *Amelanchier arborea* are also frequent, as are some of the canopy species. The shrub layer is extremely variable. Many examples have open shrub layers with a mix of species that

includes *Kalmia latifolia*, *Rhododendron calendulaceum*, *Gaylussacia ursina*, *Rhododendron maximum*, *Vaccinium pallidum*, *Vaccinium stamineum*, or *Pyrolaria pubera*. Some examples have dense shrub layers strongly dominated by *Kalmia latifolia*, *Gaylussacia ursina*, or *Vaccinium pallidum*. The herb layer generally is low in density and diversity under current conditions. *Chimphila maculata*, *Goodyera pubescens*, and *Dioscorea villosa* have high constancy. Other frequent species include *Lysimachia quadrifolia*, *Parathelypteris noveboracensis*, *Galax urceolata*, *Hylodesmum nudiflorum*, *Potentilla canadensis*, *Vilva hastata*, *Medeola virginica*, *Pyrolaria pubera*, and *Gillenia trifoliata*. Under more natural fire regimes, species of the suite of fire-tolerant herbs, such as *Danthonia spicata*, *Schizachyrium scoparium*, *Coreopsis major*, *Iris verna*, and *Tephrosia virginiana*, likely would be abundant, at least in some examples.

Range and Abundance: Ranked G5. This is one of the most extensive communities in the Mountain region of North Carolina, making up a large part of the landscape at low to moderate elevations south of Asheville. It is abundant in most parts of the region, though it is scarce in parts of the Blue Ridge escarpment. The association ranges from Virginia to Georgia.

Associations and Patterns: The Acidic Subtype is a matrix community in many places, making up a significant part of the landscape along with Acidic Cove Forest and Rich Cove Forest, grading to Chestnut Oak Forest and Pine–Oak/Heath on the sharper ridges and grading to High Elevation Red Oak Forest and Northern Hardwood Forest at higher elevations. In the foothills and northern Blue Ridge escarpment, it often occurs in small patches in gaps or upper coves, with Chestnut Oak Forest dominating the landscape. At lower elevations, below 2000 feet, it may grade to the Low Dry Subtype on south- or west-facing slopes. The Acidic Subtype may give way abruptly or gradually to the Basic Subtype where the underlying geology changes.

Variation: Montane Oak–Hickory Forest (Acidic Subtype) is one of the most broadly circumscribed communities, covering a wide range of topography and elevation. Its vegetation is also very variable, though less so than its geographic and physical site range would suggest. The specific canopy dominants often vary over short distances, defying separation, while the same mix can be present from the lowest to the highest elevations. The variation is complex, and quantitative analyses on different data sets have not identified consistent divisions within it. Two variants are tentatively recognized, with the understanding that it may also be appropriate to create additional variants.

1. Dry Heath Variant is analogous to the Dry Heath Subtype of Chestnut Oak Forest, with a dense to moderate shrub layer dominated by *Kalmia latifolia*, *Gaylussacia ursina*, *Vaccinium pallidum*, or other clonal Ericaceous shrubs. It may be appropriate to recognize separate variants for each of these dominants, as is done in Chestnut Oak Forest.
2. Herb Variant is analogous to the Herb Subtype of Chestnut Oak Forest, with an open shrub layer not strongly dominated by one of the above species, often having *Rhododendron calendulaceum* or other species abundant. Herbs may be sparse or denser.

Dynamics: Dynamics of this community are generally similar to those of Montane Oak Forests as a whole, including regeneration dynamics and an important role for moderate fire.

Following severe canopy disturbance such as logging, examples tend to regenerate as successional forests dominated by *Liriodendron tulipifera*, *Acer rubrum*, and *Robinia pseudo-acacia*, often with

large numbers of sprouts of understory species. Various oaks often are present, but in much smaller numbers. Carter, et al. (2000), sampling successional forests in the high rainfall area around Highlands, found *Robinia pseudo-acacia*, *Betula lenta*, and *Liriodendron tulipifera* to be common early successional species over a broad range of environments and elevation, but also found some *Carya glabra*, *Quercus coccinea*, *Quercus rubra*, and *Quercus alba* present in early successional forests in xeric and intermediate sites at mid to high elevations.

The relationship with the similar White Pine Subtype is somewhat uncertain and needs further investigation. Abella and Shelburne (2003) documented the establishment of *Pinus strobus* and abundance of young pines in an oak forest at Ellicott Rock Wilderness where none had been present before 1900 and only small amounts since 1950. Understory and sapling pines were most strongly correlated with the presence of the few large pines. This would suggest the White Pine Subtype may simply be a fire suppression artifact or some recent alteration. However, in other places an apparently similar history does not lead to pine invasion, and the two subtypes seem more distinct.

Comments: Montane Oak–Hickory Forest was newly recognized with the 3rd Approximation and were not present in earlier editions. A comparable community was not recognized by Whittaker (1956). It apparently is not present in the part of the Great Smoky Mountains where his study concentrated, though it is extensive in the North Carolina portion. Comparable communities were recognized in studies in southern North Carolina, such as those of Racine and Hardin (1975) and Cooper and Hardin (1970). They are recognized in Newell (1997) and, though less common in his study area, by McLeod (1988).

Carter et al. (2000), in their analysis of old-growth plots in the high rainfall area around Highlands, found *Quercus alba* indicative of higher elevations (above 4000 feet) in their data set of old-growth forests, along with *Castanea dentata* and *Gaylussacia ursina*. This is similar to Whittaker's (1956) recognition of white oak forest only at higher elevation. However, the limited remaining legacy of old-growth forests may be misleading in this regard, as mature second growth Montane Oak–Hickory Forest is present throughout the elevational range in the Highlands area. Baranski (1975) emphasized the occurrence of *Quercus alba* throughout the elevation range of the North Carolina mountains.

The relationship of higher elevation examples of Montane Oak–Hickory Forest to High Elevation White Oak Forest needs clarification. The Acidic Subtype can range to high elevations and shares many species with High Elevation White Oak Forest. The latter appears to be tied to more extreme sites and to have reduced species richness, but the differences need further investigation. The distinction is confused by the application of Whittaker's (1956) high elevation white oak forest concept to lower elevation mixed forests before the development of the Montane Oak–Hickory Forest concept.

Rare species: Vascular plants – *Cirsium carolinianum*, *Fleishmania incarnata*, *Fothergilla major*, *Liatris microcephala*, *Lysimachia tonsa*, *Monotropsis odorata*, *Rhododendron vaseyi*, *Sisyrinchium dichotomum*, *Thermopsis fraxinifolia*, *Thermopsis mollis*. Nonvascular plants – *Canoparmelia amabilis*. Animals – *Aneides aeneus*, *Crotalus horridus*, *Eumeces anthracinus*, *Plethodon yonahlossee*, *Sphyrapicus varius*.

References:

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